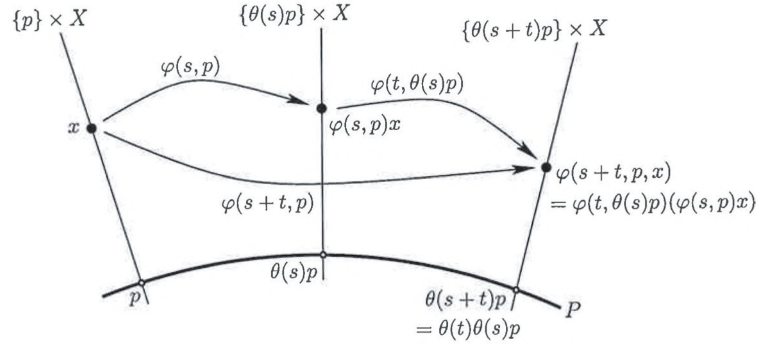
PREFACE

An international workshop sponsored by the German Research Council (DFG) on the Foundations of Nonautonomous Dynamical Systems was held in Friedrichsdorf near Frankfurt am Main from September 28 to October 2, 2003.[a] Its aim was to bring together experts in the various fields of nonautonomous dynamical systems (NDS) and to broach the variety of aspects common to three main branches of this field: random dynamical systems, control systems, and deterministic nonautonomous systems.

The basic structure inherent in nonautonomous dynamical systems is the skew product formalism (θ, φ), where θ: $P \to P$ models the nonautonomy and φ: $\mathbb{R} \times P \times X \to X$ describes the solution in X. Depending on the context, P is a probability space (random dynamical system), a set of control functions (control system) or the topological hull of the system (deterministic nonautonomous system). The systems are skew products since θ acts on P, whereas φ acts on the bundle over P:



An alternative description is the process formalism which involves a two-parameter flow $\varphi_{t,s}(p,x) := \varphi(t-s, \theta_s p, x)$.

In recent years there has been a growing awareness that — in spite of technical differences — each of these fields could benefit from each other through this unifying point of view. This has resulted in numerous papers and several monographs on random dynamical systems, control systems and deterministic nonautonomous

[a]http://scicomp.math.uni-augsburg.de/~control/nads/

systems emphasizing the skew product approach. We mention in particular Ludwig Arnold's seminal monograph *Random Dynamical Systems* (Springer, 1998).

This special issue of *Stochastics and Dynamics* contains 12 papers in the spirit of this approach to nonautonomous dynamical systems, ranging from Morse decompositions, robust asymptotic controllability, inertial manifolds and bifurcation theory over linear theory to pullback attractors and attractor dimension for partial differential equations. Other diverse aspects of nonautonomous dynamical systems such as numerical methods for systems with delay, invariant measures, asymptotic stability and Lyapunov exponents and the existence of almost periodic solutions are also treated.

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